

CLAIMS

1. A noncontacting short-range communication device for a slide door comprising:

5 a rail provided in a vehicle body;

a slide part provided in a slide door sliding being guided by the rail;

a first antenna member attached to the rail in the longitudinal direction of the rail;

a second antenna member provided in the slide part so as to face to
10 the first antenna member closely;

a first communication unit provided on the side of the vehicle body being connected to the first antenna member; and

a second communication unit having the same constitution as that of the first communication unit, the second communication unit being
15 provided on the side of the slide door being connected to the second antenna member,

wherein the first and second communication units transmit or receive data by electromagnetic induction coupling between the first and second antenna members,

20 wherein each of the first and second communication units is supplied with electric power from a battery and includes a microcomputer and a data communication circuit controlled by the microcomputer, the data communication circuit performing semi-duplex bidirectional communication,

25 wherein the data communication circuit includes:

a transmitting section, to which a clock pulse of the microcomputer

is supplied, for transmitting a modulated wave obtained by on-off modulating the clock pulse as a base signal with the data having a serial communication form through the antenna member; and

5 a receiving section for receiving and demodulating the modulated wave through the antenna member so as to gain the data having a serial communication form.

2. The device according to claim 1, wherein at least one of the first and second communication units further includes an impedance-adjusting transformer connected between the antenna member and the transmitting and receiving sections.

10 3. The device according to claim 1 or 2, wherein the transmitting section includes:

a modulation circuit, to which a clock pulse of the microcomputer is supplied, for on-off modulating the clock pulse as a base signal with the data having a serial communication form;

15 a waveform-shaping filter for waveform-shaping a modulated wave from the modulation circuit; and

a transmitting driver, to which an output from the waveform-shaping filter is supplied, for driving the antenna member,

20 wherein the receiving section includes:

a tuning circuit connected to the antenna member, for tuning to a clock pulse frequency of the microcomputer; and

a demodulation circuit for demodulating an output from the tuning circuit so as to gain the data.

25 4. The device according to claim 3, wherein the transmitting section further includes a control section for rendering the data communication

circuit into a low electric power consumption mode on the basis of control by the microcomputer.

5. The device according to claim 3, wherein the demodulation circuit includes:

5 a detection circuit for detecting an output from the tuning circuit; and

a first comparator for comparing a detected output from the detection circuit with a first reference level so as to gain the data.

6. A noncontacting short-range communication device for a slide door
10 comprising:

a rail provided in a vehicle body;

a slide part provided in a slide door sliding being guided by the rail;

a first antenna member attached to the rail in the longitudinal direction of the rail;

15 a second antenna member provided in the slide part so as to face to the first antenna member closely;

a first communication unit provided on the side of the vehicle body being connected to the first antenna member; and

a second communication unit having the same constitution as that of
20 the first communication unit, the second communication unit being provided on the side of the slide door being connected to the second antenna member,

wherein the first and second communication units transmit or receive data by electromagnetic induction coupling between the first and second
25 antenna members,

wherein each of the first and second communication units is supplied

with electric power from a battery and includes a microcomputer and a data communication circuit controlled by the microcomputer, the data communication circuit performing semi-duplex bidirectional communication,

5 wherein the data communication circuit includes:

a transmitting section, to which a clock pulse of the microcomputer is supplied, for transmitting a modulated wave obtained by on-off modulating the clock pulse as a base signal with the data having a serial communication form and a security ID code of the semi-duplex
10 bidirectional communication through the antenna member; and

a receiving section for receiving and demodulating the modulated wave through the antenna member so as to gain the data having a serial communication form and the ID code,

wherein the microcomputer includes:

15 storing means for storing the ID code in advance; and

collating means for collating the ID code stored in the storing means with the ID code gained by the receiving section.

7. The device according to claim 6, wherein at least one of the first and second communication units further includes an impedance-adjusting
20 transformer connected between the antenna member and the transmitting and receiving sections.

8. The device according to claim 6 or 7, wherein the transmitting section includes:

a modulation circuit, to which a clock pulse of the microcomputer is
25 supplied, for on-off modulating the clock pulse as a base signal with the data having a serial communication form and the security ID code of the

semi-duplex bidirectional communication;

a waveform-shaping filter for waveform-shaping a modulated wave from the modulation circuit; and

a transmitting driver, to which an output from the waveform-shaping filter is supplied, for driving the antenna member,
5 wherein the receiving section includes:

a tuning circuit connected to the antenna member, for tuning to a clock pulse frequency of the microcomputer; and

a demodulation circuit for demodulating an output from the tuning
10 circuit so as to gain the ID code and the data.

9. The device according to claim 8, wherein the transmitting section further includes a control section for rendering the data communication circuit into a low electric power consumption mode on the basis of control by the microcomputer.

15 10. The device according to claim 8, wherein the communication unit has a normal communication mode and an ID code-rewriting mode as operation modes thereof,

wherein upon the normal communication mode, the modulation circuit is supplied with a clock pulse of the microcomputer and outputs a
20 modulated wave obtained by on-off modulating the clock pulse as a base signal with the data having a serial communication form and the ID code, while upon the ID code-rewriting mode, the modulation circuit is supplied with a clock pulse of the microcomputer and outputs a modulated wave obtained by on-off modulating the clock pulse as a base
25 signal only with the ID code,

wherein upon the ID code-rewriting mode, a transmission output level of

the transmitting driver is switched from a normal communication mode level to an ID code-rewriting mode level that is larger than the normal communication mode level according to an ID code-rewriting control signal from the microcomputer, and

5 wherein the demodulation circuit includes:

a detection circuit for detecting an output from the tuning circuit;

a first comparator for comparing a detected output from the detection circuit with a first threshold level so as to gain the data; and

a second comparator for comparing a detected output from the
10 detection circuit with a second threshold level that is higher than the first threshold level so as to gain the ID code.